

# **Feeding Dairy Cows When Corn Prices are High OR**

## **“The Cows vs. Cars Debate”**



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Department of Animal Sciences**



# Survey Results of Diets Fed to Lactating Cows Around the Country

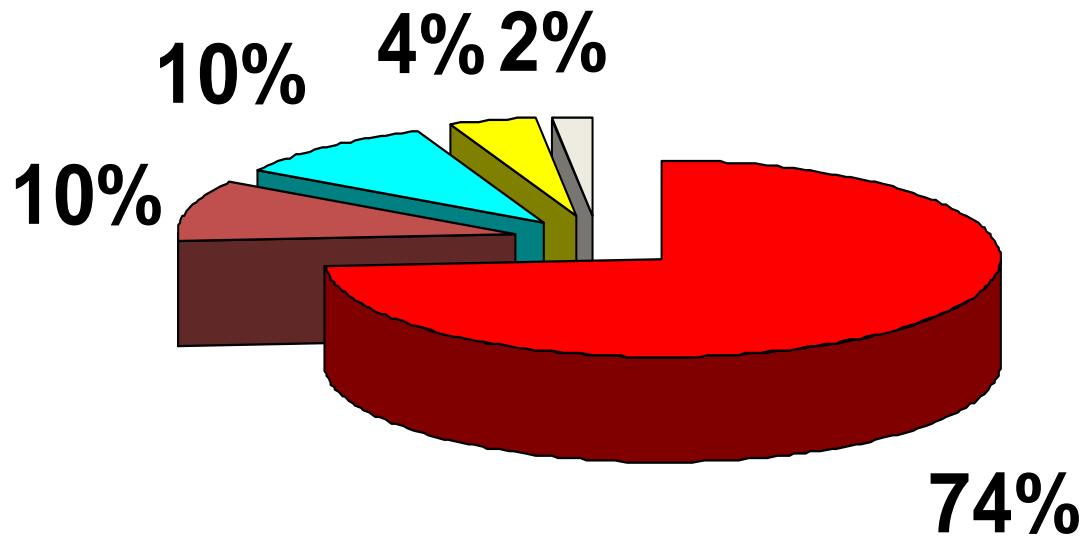
Source	Region	Rolling Herd Average, lb	# of Herds	Starch, % of diet	
				Minimum	Maximum
Hall & Van Horn, 2001	U.S.			15	27
Johnson et al., 2002	WA	≥ 28,000	7	17	25
Shaver & Kaiser, 2004	WI	≥ 29,000	6	25	30
Chase, 2006	East, Midwest	≥ 29,000	25	21	30

# Dietary Starch Target for Milk Cows?

**24 to 26%**



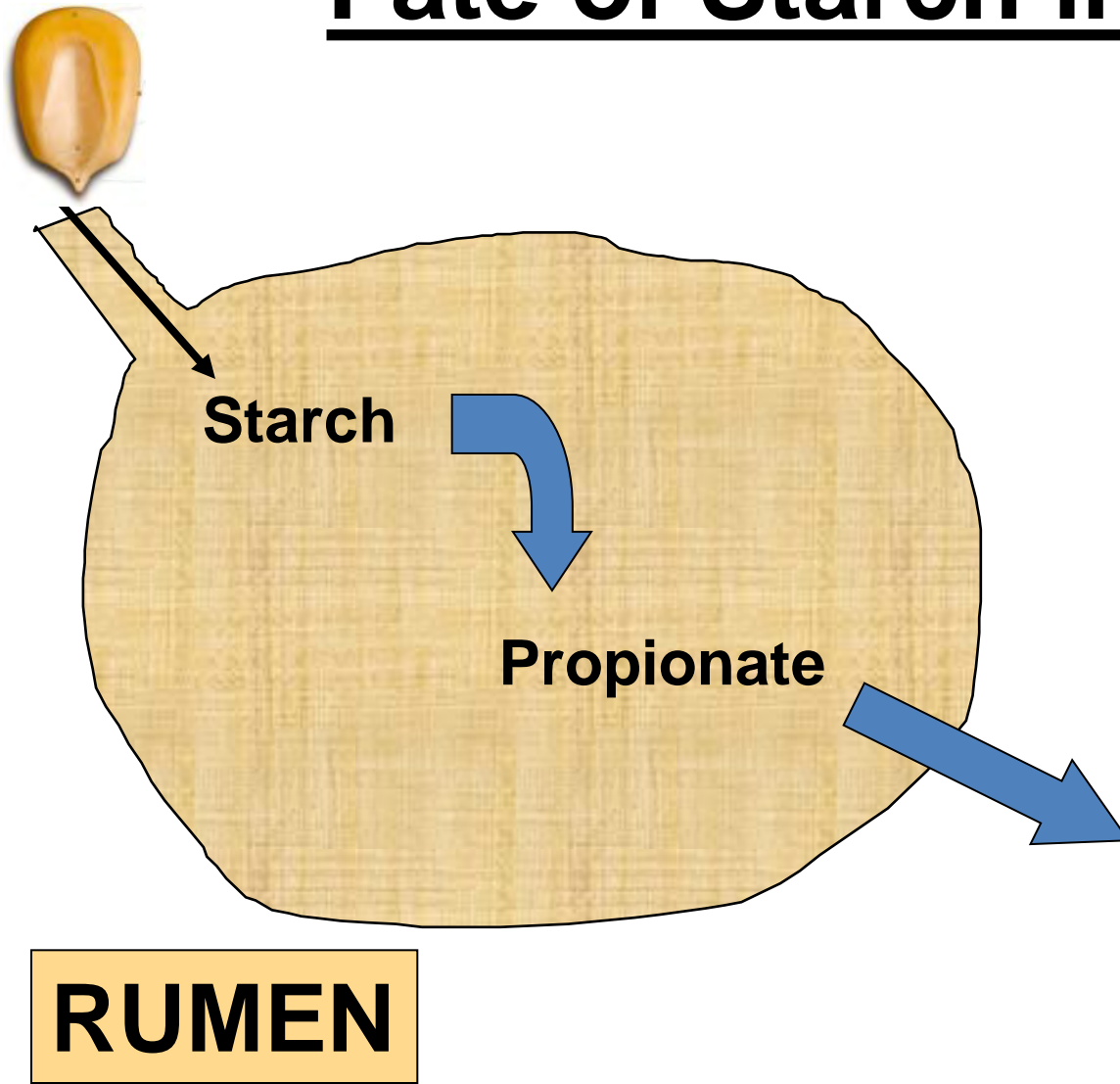
# Why is Corn so Popular?



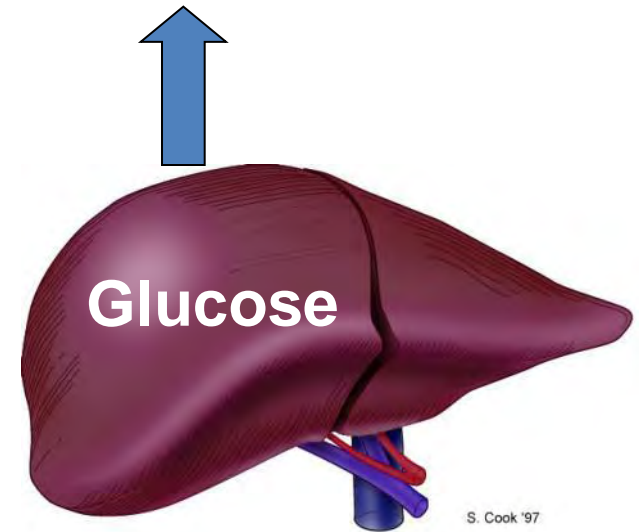
■ Starch ■ Protein ■ Fiber ■ Fat ■ Minerals

**Starch is highly digested (~95%) by the cow.**

# Fate of Starch in the Cow

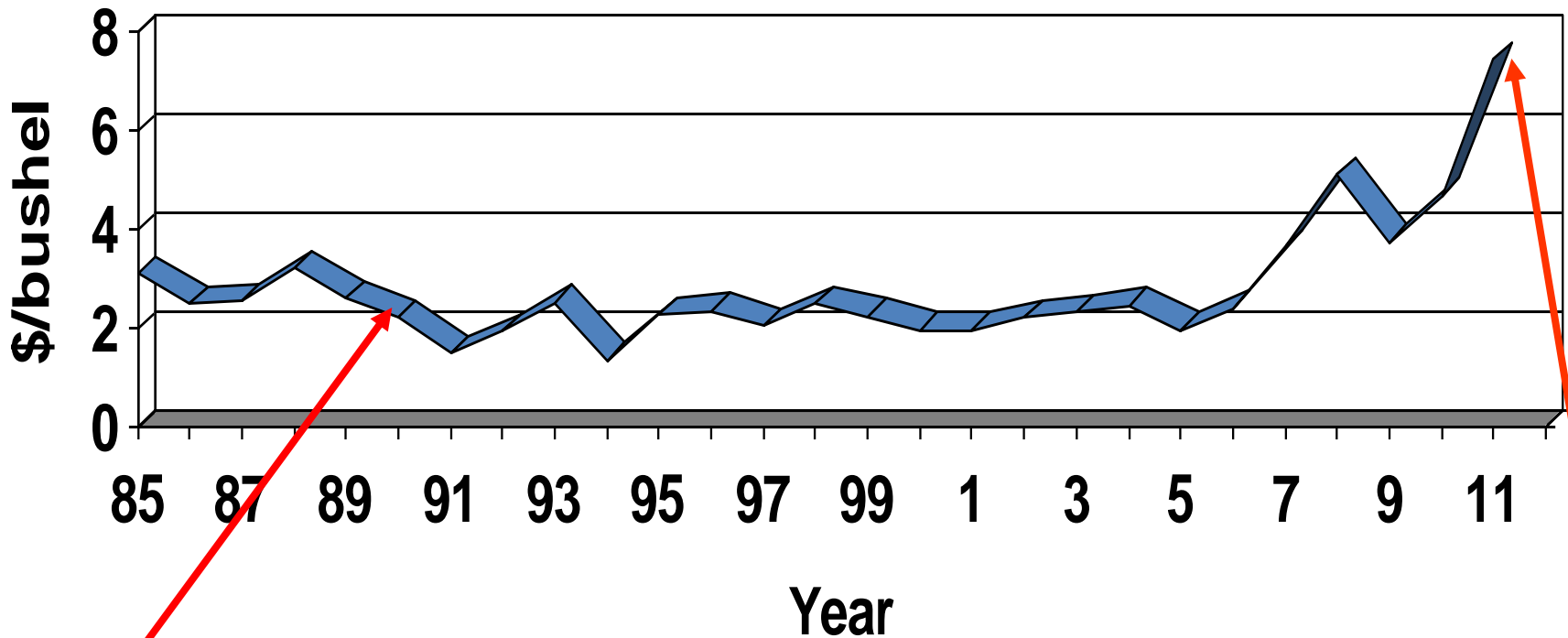


Glucose → Lactose



Liver

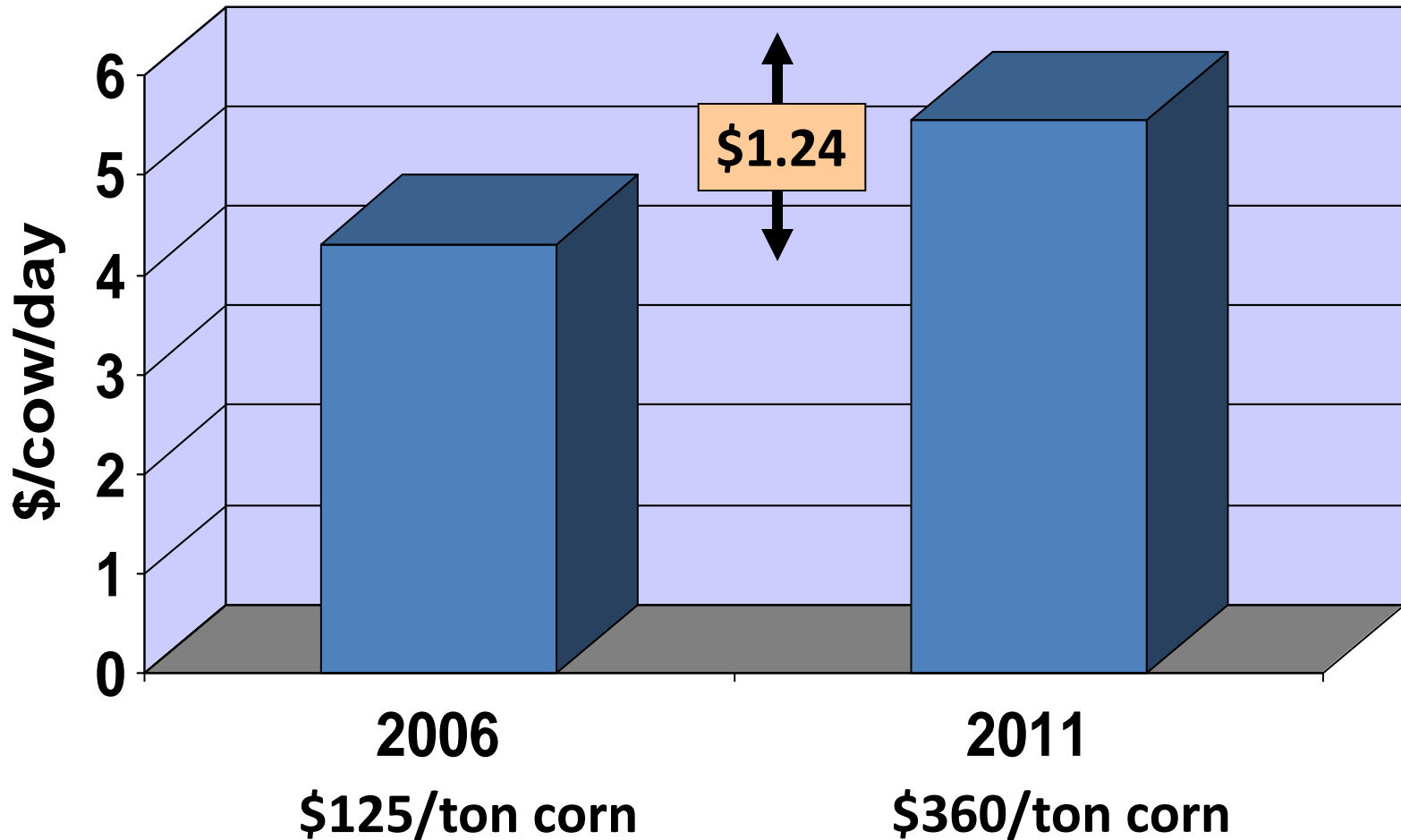
# Historical Price of # 2 Yellow Corn in Chicago



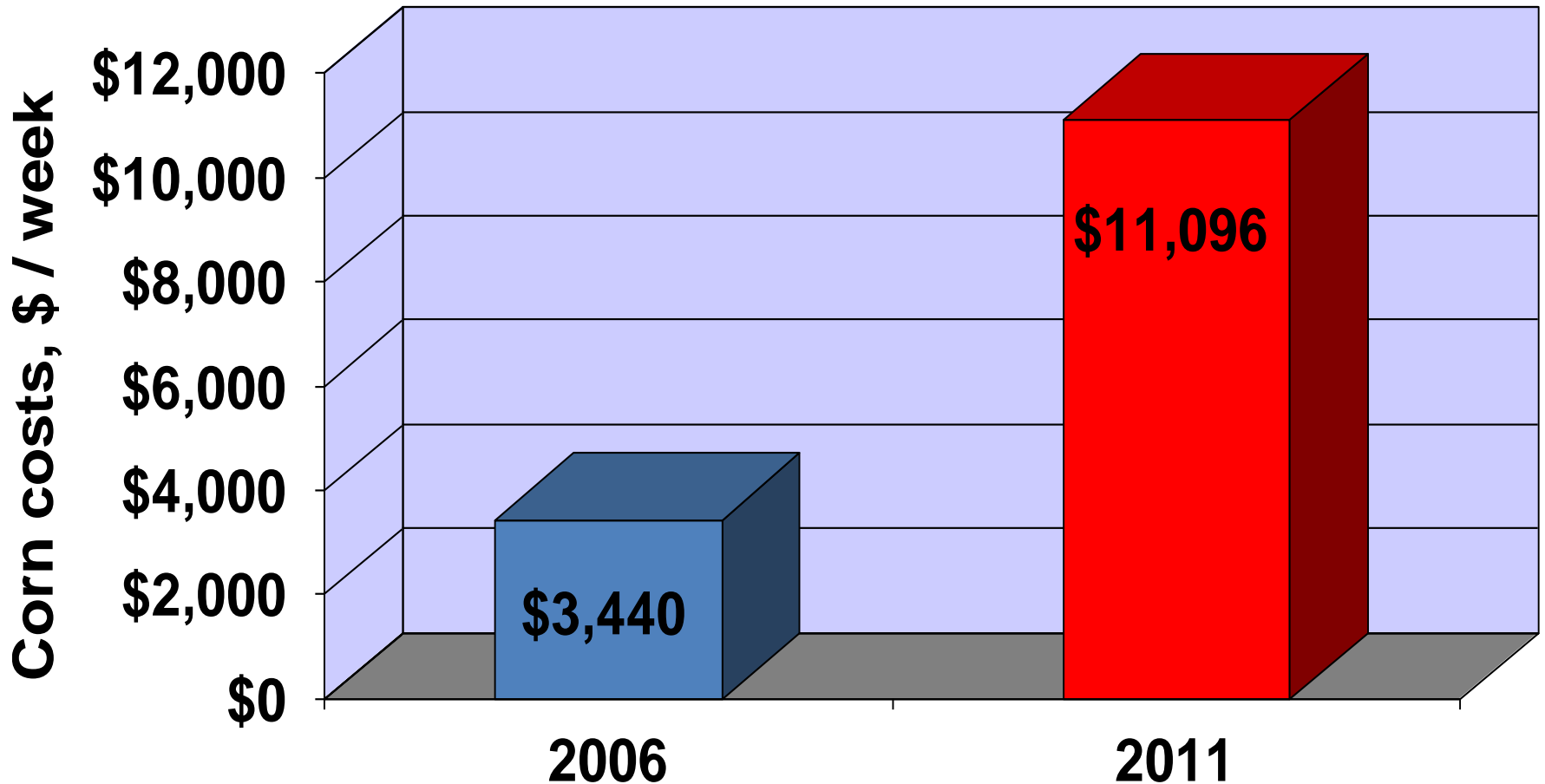
\$125/ton in FL

\$360/ton in FL

# Ration Costs in 2006 and 2011 When Corn Makes up 18% of Ration DM

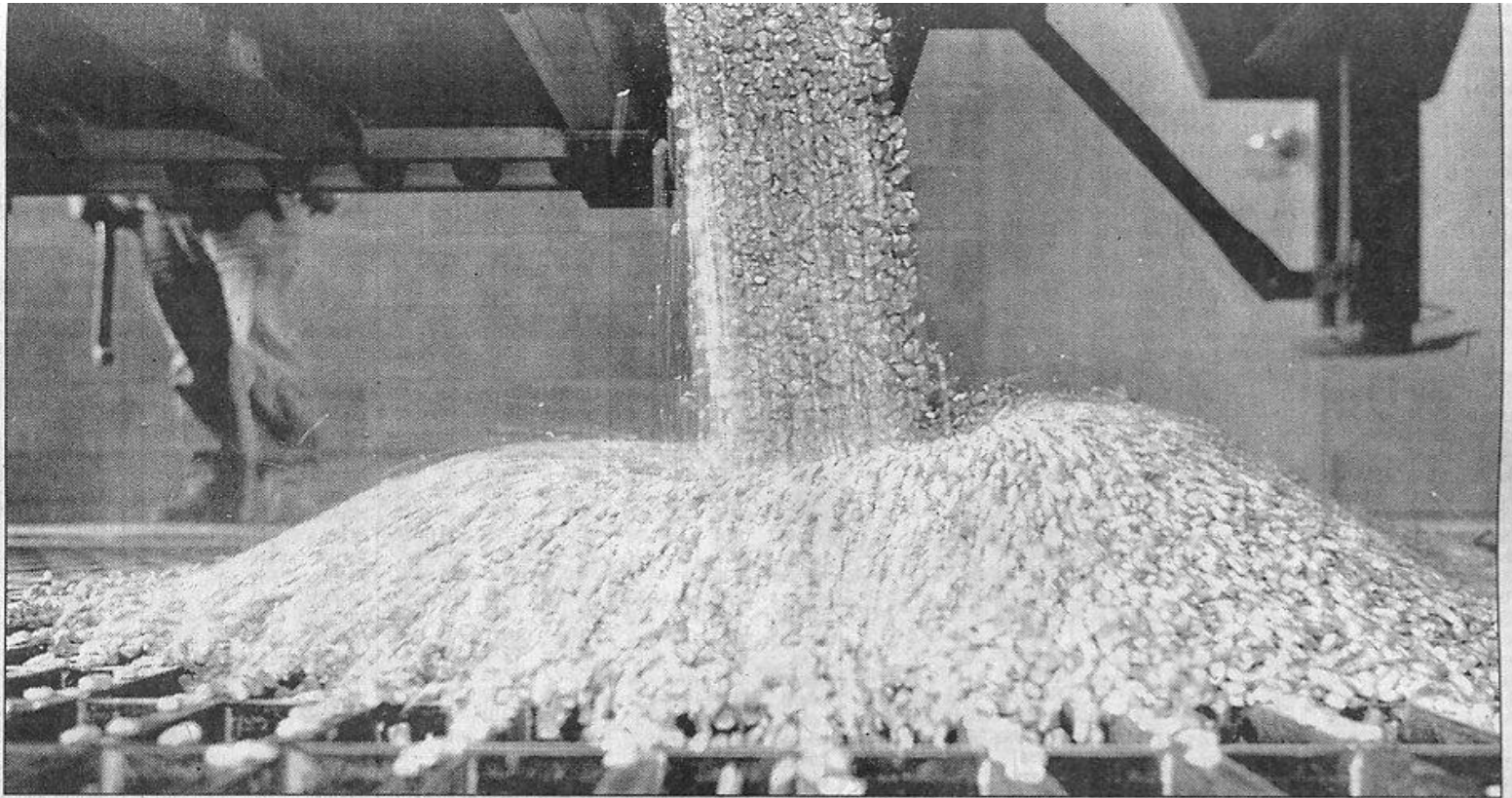


# Increasing On-Farm Corn Costs



950 milk cows



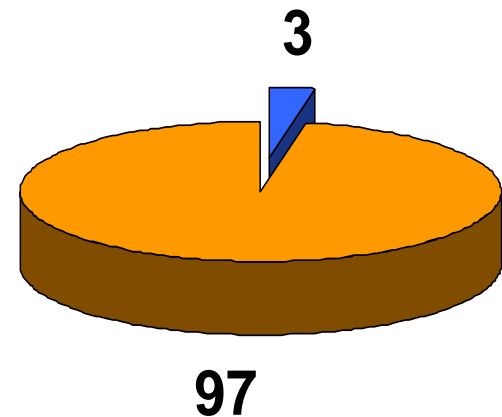
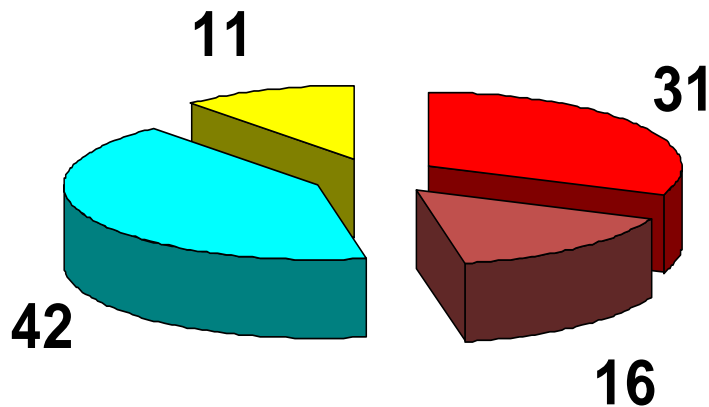


The Associated Press

Corn is unloaded at the Badger State Ethanol plant in Monroe, Wis., in this Sept. 23, 2005, photo.

# Ethanol could bring biggest U.S. corn crop since 1944

# Ethanol from Corn Will Never Replace Gasoline Totally



■ Ethanol ■ Exports ■ Livestock ■ Human

■ Ethanol ■ Gasoline

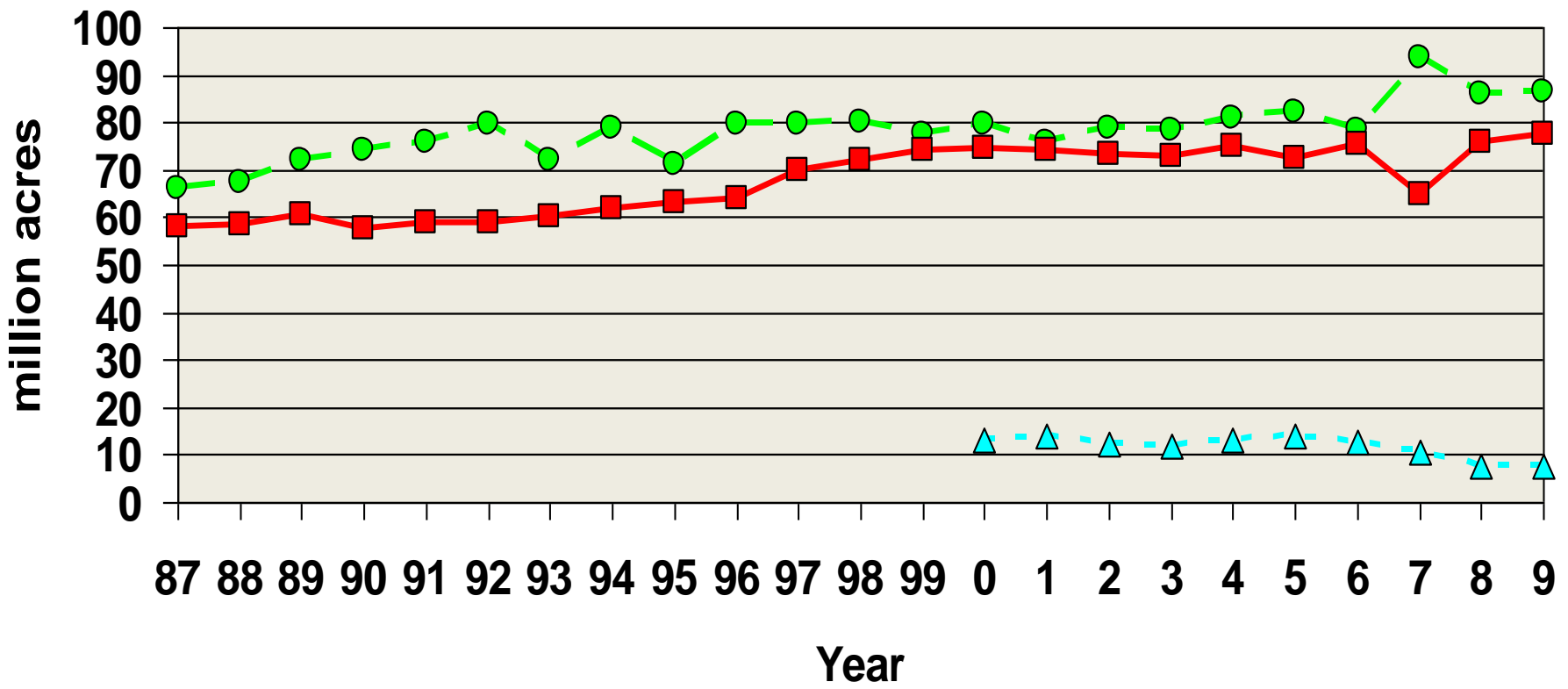
**% of corn going toward ethanol**

**% of gas replaced by ethanol**

*40% of US corn going to ethanol in 2011*

# Acres Planted to Corn, Soybeans, and Cottonseed in U.S. Since 1987

● Corn ■ Soybeans ▲ Cotton



# Can Less Starch (Corn) be Fed to Our Cows?

- **YES!!!**
- **Why?**
  - Starch is NOT a required nutrient
  - Other fermentable carbohydrates can be used by microbes in rumen for growth and production of volatile fatty acids
    - Digestible fiber, sugar

# How to Cope?

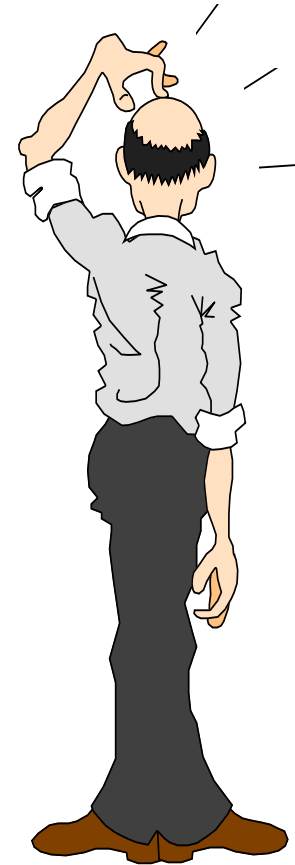
- **Hope for higher milk prices.**
  - **\$18/cwt  $\longrightarrow$  \$19.80/cwt will cover increased corn price over the last 5 years.**



- **Consider feeding alternative feedstuffs.**

# Alternative Feeds to Corn?


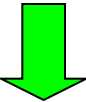
- **Corn silage – high starch**
- **Soybean hulls**
- **Citrus pulp**
- **Corn gluten feed**
- **Distillers grains**
- **Wheat midds**
- **Hominy**



# Byproducts partially replacing corn<sup>1</sup>

<b>Feed, % of diet DM</b>	<b>Cost, \$/ton</b>	<b>Break-even cost to replace corn &amp; SBM</b>
<b>Corn (18%)</b>	<b>360</b>	<b>- - -</b>
<b>Soybean meal</b>	<b>425</b>	<b>- - -</b>
<b>Hominy (18%)</b>	<b>335</b>	<b>\$372</b>
<b>Distillers (20%)</b>	<b>250</b>	<b>\$401</b>
<b>Gluten feed (10%)</b>	<b>210</b>	<b>\$381</b>
<b>Soy hulls (14%)</b>	<b>210</b>	<b>\$346</b>
<b>Citrus pulp (10%)</b>	<b>210</b>	<b>\$305</b>
<b>Wheat midds (10%)</b>	<b>170</b>	<b>\$290</b>

# Replace Some Corn With Corn Silage

- Corn silage is ~36% starch
- Feed MORE corn silage if inventory allows it.
-  corn silage by 2 lb =
-  in ground corn of 1 lb
- Ration savings = 6¢ / cow





# Starch in Corn Silage – Hybrids Matter

- **Corn hybrids vary in their ratio of forage to corn grain**
- **Hybrid 1 - 60%:40% (F:G)**
  - 40% grain x 70% starch =  
28% starch hybrid
- **Hybrid 2 - 50%:50% (F:G)**
  - 50% grain x 70% starch =  
35% starch hybrid



# Starch in Corn Silage Hybrids

- **97 hybrids grown in Gainesville in 2009 and 2010**
  - % starch ranged from 27% to 43%; average of 36%
- **Syngenta 82V3000GT had more starch (42%) and digestible fiber in 2009 and 2010 with average DM yields**



# Soybean Hulls

- **Byproduct of manufacturing of soybean oil and soybean meal**
- **Outer fibrous covering of soybeans**
- **High lysine, low P, & highly digestible fiber**



# Corn vs. Soybean Hulls

<b>Measure</b>	<b>Corn</b>	<b>Soy hulls</b>
<b>Starch, %</b>	<b>71</b>	<b>1.6</b>
<b>Fat, %</b>	<b>4.4</b>	<b>3.1</b>
<b>Fiber, %</b>	<b>9.5</b>	<b>61.4</b>
<b>Net energy, Mcal/lb</b>	<b>0.95</b>	<b>0.66</b>
<b>Protein, %</b>	<b>9.5</b>	<b>14.2</b>
<b>Phosphorus, %</b>	<b>0.32</b>	<b>0.20</b>

# Soybean Hulls Partially Replaced Corn

<b>Ingredient</b>	<b>0% SBH</b>	<b>13% SBH</b>
<b>Corn silage, %</b>	<b>33</b>	<b>33</b>
<b>Alfalfa silage, %</b>	<b>17</b>	<b>17</b>
<b>Ground corn, %</b>	<b>23</b>	<b>4</b>
<b>Soybean hulls, %</b>	<b>15</b>	<b>13</b>
<b>Starch, % of diet</b>	<b>27</b>	<b>22</b>

# Soybean Hulls Partially Replacing Corn

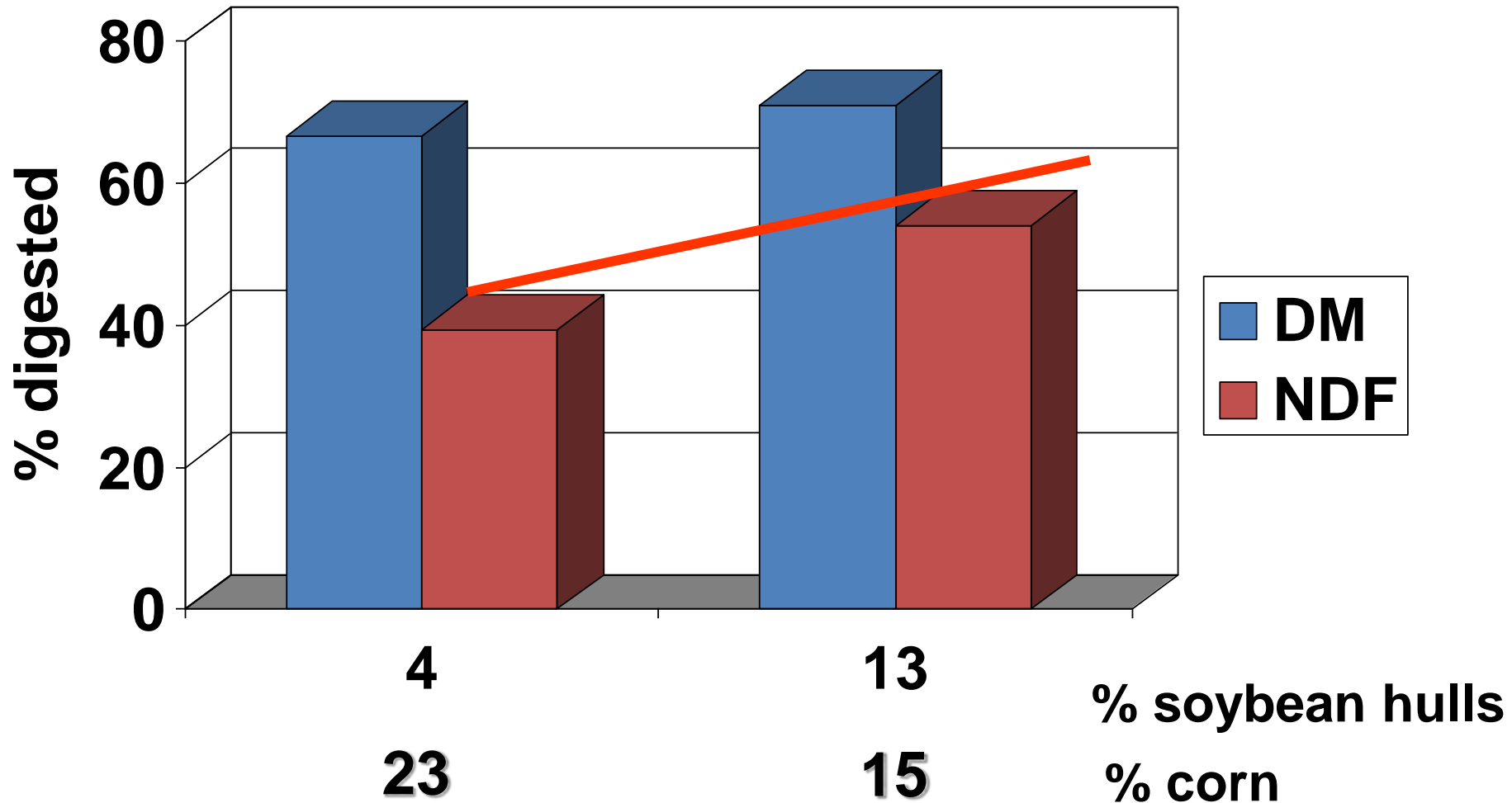
Measure	0% SBH	14% SBH
DM intake, lb/d	58.8 <sup>a</sup>	64.1 <sup>b</sup>
Milk, lb/d	109.8	112.2
Milk fat, %	3.08	3.33
Milk protein, %	3.07	2.99
Milk - Ration savings, \$/day		0.95 <sup>c</sup>

<sup>a,b</sup> Values with different letters are different.

<sup>c</sup>Soyhulls at \$210/ton  
Corn at \$360/ton

Gencoglu et al., 2010

# Digestibility of Diets When Soybean Hulls Replaced Corn (Univ. Wisconsin, 2010)

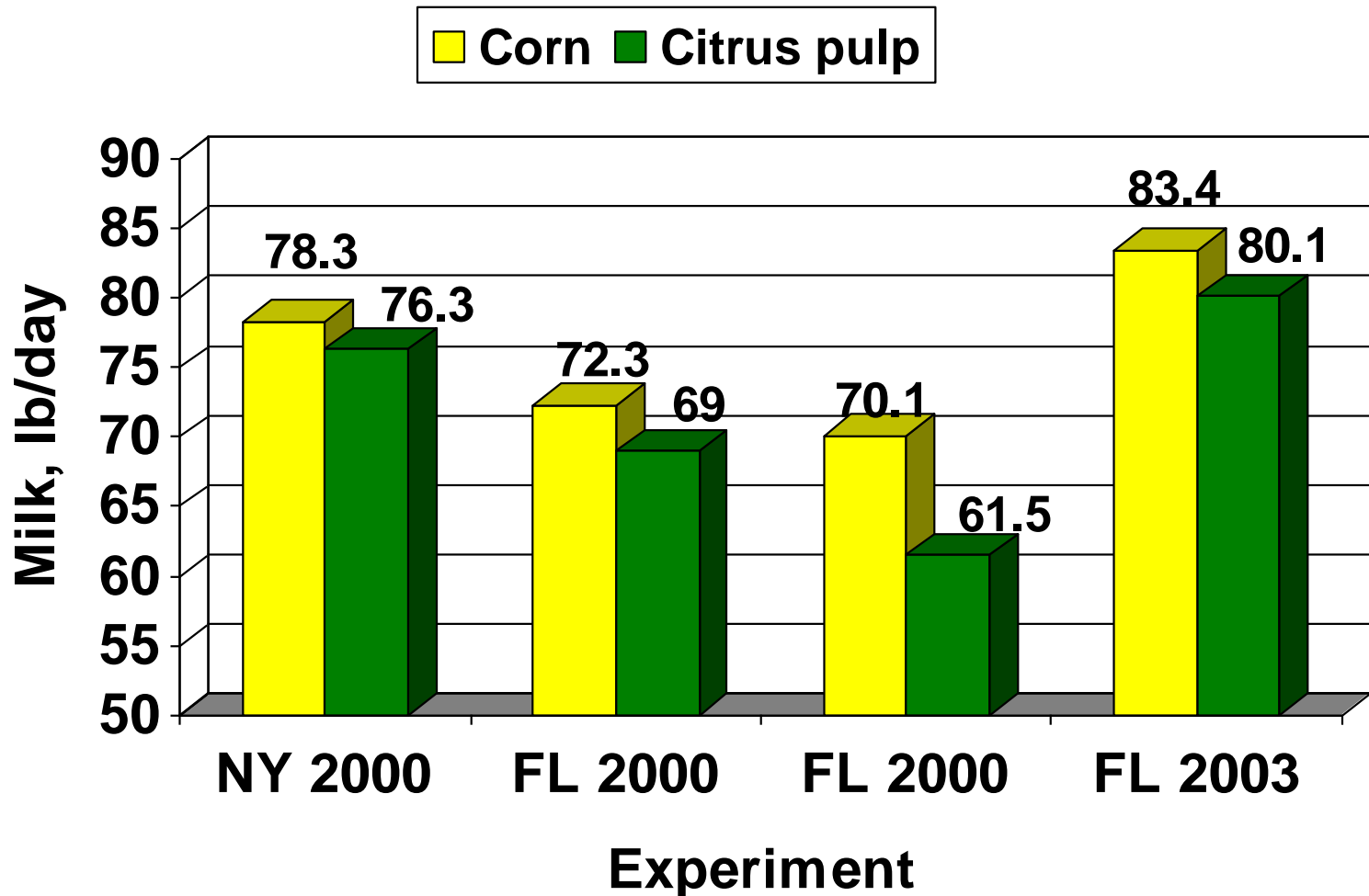


## Corn vs. Citrus Pulp

<b>Measure</b>	<b>Corn</b>	<b>Citrus pulp</b>
<b>Starch, %</b>	<b>71</b>	<b>3</b>
<b>Sugar, %</b>	<b>3</b>	<b>25</b>
<b>Fiber, %</b>	<b>10</b>	<b>24</b>
<b>Net energy, Mcal/lb</b>	<b>0.95</b>	<b>0.74</b>
<b>Protein, %</b>	<b>9.5</b>	<b>7</b>
<b>Phosphorus, %</b>	<b>0.32</b>	<b>0.12</b>

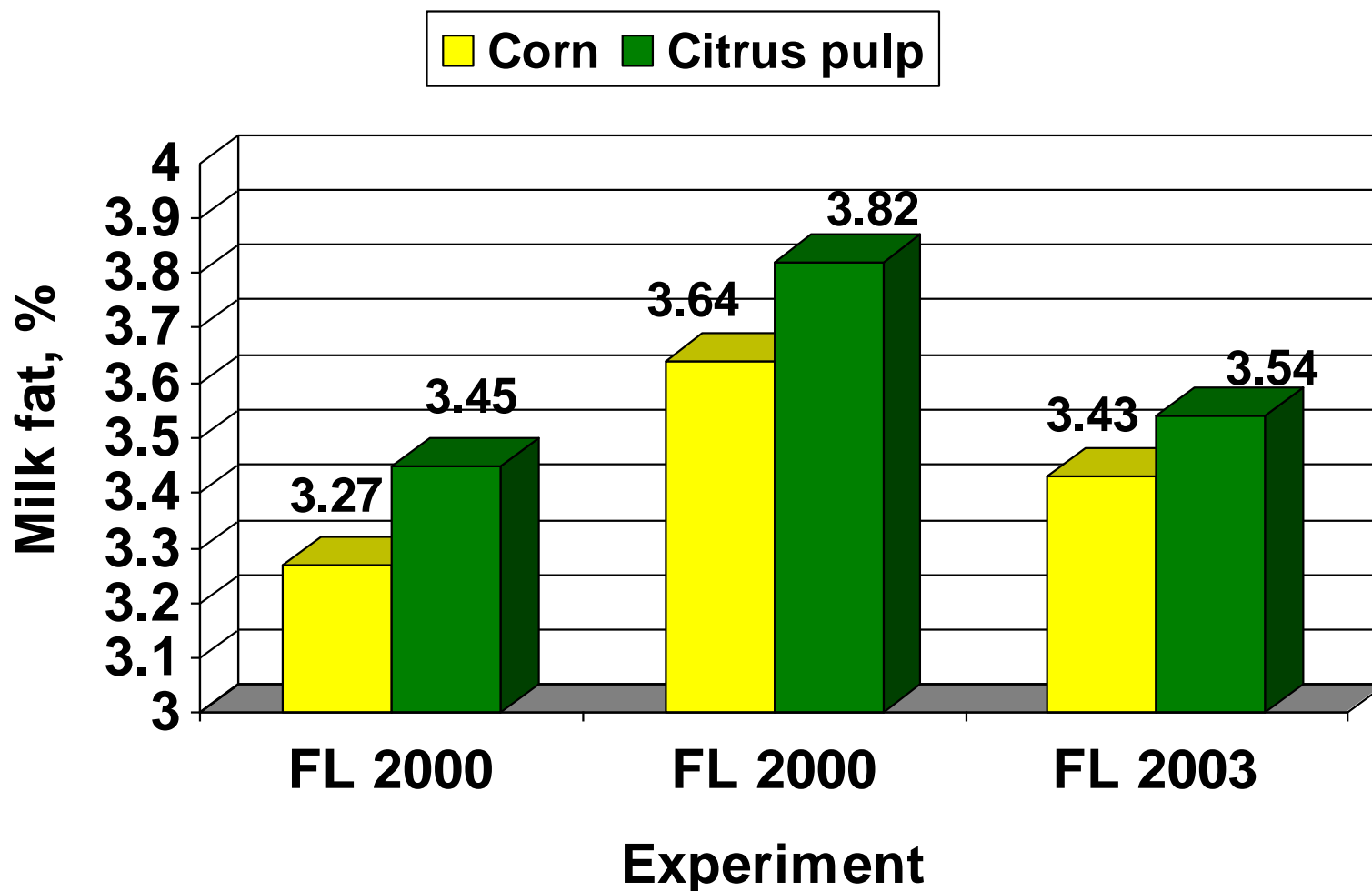


# Milk Response to Replacing Corn with Citrus Pulp



Corn or Citrus Pulp Fed at ~20% of Diet

# Milk Fat Response to Replacing Corn or Hominy with Citrus Pulp

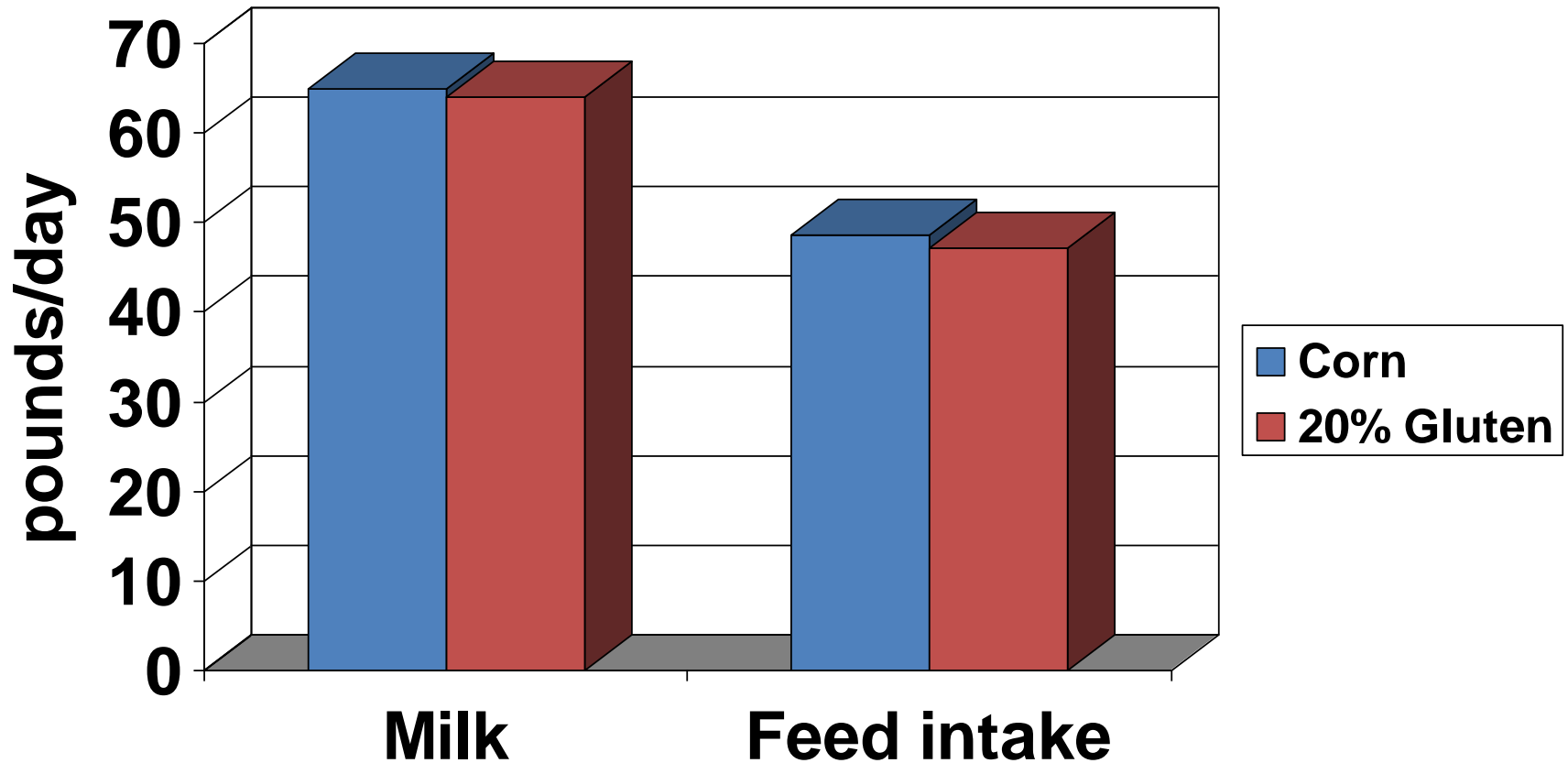


Corn or Citrus Pulp Fed at ~20% of Diet

# Corn vs. Corn Gluten Feed

<b>Measure</b>	<b>Corn</b>	<b>Gluten Feed</b>
<b>Starch</b>	<b>71</b>	<b>16</b>
<b>Fat</b>	<b>4.4</b>	<b>3.9</b>
<b>Fiber</b>	<b>9.5</b>	<b>36</b>
<b>Energy</b>	<b>0.95</b>	<b>0.77</b>
<b>Protein</b>	<b>9.5</b>	<b>23.5</b>
<b>Phosphorus</b>	<b>0.32</b>	<b>1.09</b>

# Corn Gluten Feed Replaced Corn Without Affecting Cow Performance



Average of 5 experiments.

# Concerns of Feeding Gluten Feed

- **Variability of nutrients is greater in CGF**

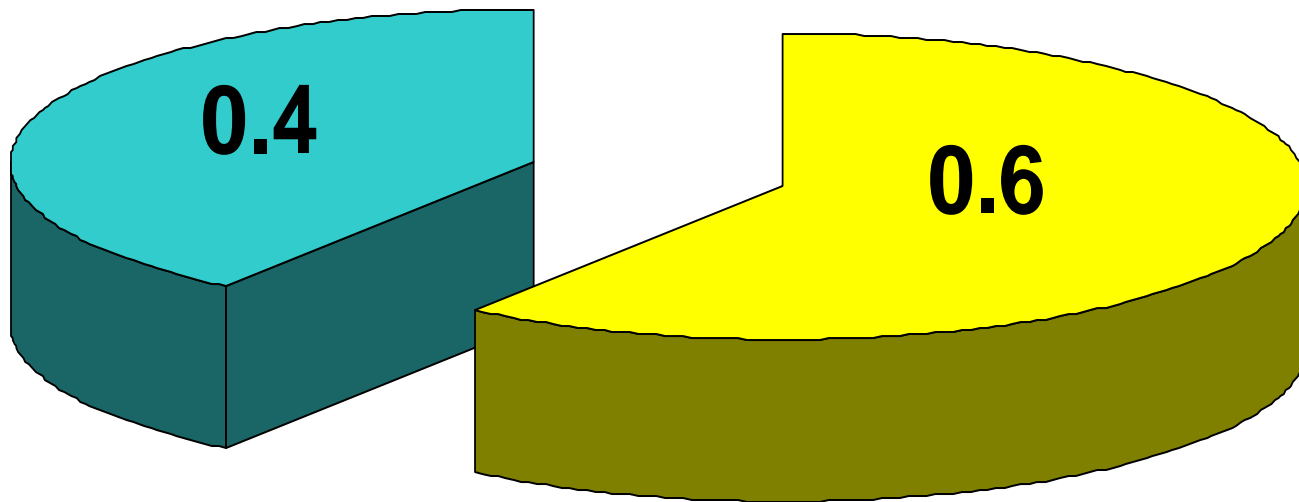
	<u>CGF</u>		<u>Corn</u>	
– Protein:	23	7%	9.5	1.6%
– Fiber:	36	7%	10	3%
– Phosphorus:	1.1	0.3%	0.3	0.1%

- **Digestibility of protein may be reduced if wet mill overheats the CGF. Test for ADIN; should be less than 10% of protein**

# Corn vs. Distillers Grains Solubles

<b>Measure</b>	<b>Corn</b>	<b>Distillers Grains</b>
<b>Starch, %</b>	<b>71</b>	<b>6</b>
<b>Fat, %</b>	<b>4.4</b>	<b>13.0</b>
<b>Energy, Mcal</b>	<b>0.95</b>	<b>0.94</b>
<b>Protein, %</b>	<b>9.5</b>	<b>30.3</b>
<b>Phosphorus, %</b>	<b>0.32</b>	<b>0.92</b>

**1 lb of Distillers is Equal to:**



**■ Corn ■ Soybean meal**

# Distillers Grains replaces Corn - University of Florida

Measure	0% DDGS	20% DDGS
DM intake, lb/d	51.7	49.8
Milk, lb/d	58.9 <sup>a</sup>	60.6 <sup>b</sup>
NDF digestion, %	47 <sup>a</sup>	55 <sup>b</sup>
Cost savings, ¢/d		0.76

<sup>a,b</sup> Values with different letters are different.

Corn at \$360/ton; SBM at \$425/ton; Distillers at \$250/ton.

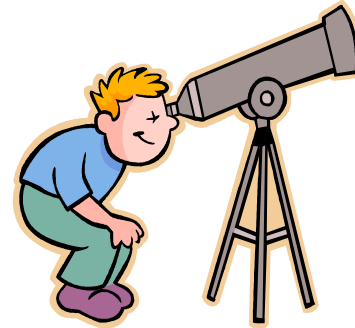


# Concerns of Feeding Distillers

- **Reducing soybean meal with distillers lowers lysine content of diet**
- **Overfeeding of unsaturated fat can cause milk fat depression in high grain diets.**
  - Cottonseed, brewers, rumensin
- **Overfeeding Phosphorus and Nitrogen**

# Summary

- **Corn prices will remain high for the foreseeable future.**



- **Several byproducts can partially replace corn successfully. Lower-starch (18 to 21%) diets can be fed without sacrificing feed efficiency, milk yield, or milk components.**

# Commodity Shipments Must be Analyzed Regularly

- **Protein including unavailable protein**
- **Phosphorus**
- **Fat**

